

Appendix 1

NUTRIENT BUDGET WORKSHEET

Decision maker: _____ Field number: _____

Prepared by: _____
Date: _____

Dominant soil
type: _____

Previous crop: _____ Yield: _____ Nutrients applied: _____

Planned crop: _____ Yield
goal¹: _____

	N	P ₂ O ₅	
Nutrients required for yield goal ²	_____	_____	[1]
or			
Nutrient recommendations from soil tests			

Conversion values:

P multiplied by 2.3 = P₂O₅

K multiplied by 1.2 = K₂O

Nutrient credits

Legume credit ³ [2]	_____	NA	NA
Manure and organic waste ⁴ [3]	_____	_____	_____
Other contributions ⁵ [4]	_____	_____	_____
Total credits [2]=[3]=[4]	_____	_____	[5]

Nutrient balance

Nutrient additions needed (or surplus) for crop yield[1]-[5]	_____	_____	[6]
-----------------------------------------------------------------	-------	-------	-----

Nutrient source:

Application method:

Application dates:

FOOTNOTES

1. Yield goal can be based on any of the following criteria:
 - a. Soil - Expected yields are published in soil survey reports. States have developed soil productivity groups.
 - b. Available soil moisture - with and without irrigation.
 - c. Field records - Farm records over extended periods (5 year minimum), FSA cropping history, field plot trials.
 - e. Other acceptable methods of determining realistic yield goals.
2. Nutrient requirements based on university and extension recommendations using soil test results. The amount of nutrients required by the plants can be used if Extension Service soil test recommendations are not available.
3. Based on Penn State University Agronomy Guide.
4. Record the plant available nutrients that will be supplied during the planned crop growing season. Include residual nutrients available from previous manure applications.
5. Other contributions may be:
 - a. nutrients contained in irrigation water.
 - b. material used as soil amendment (fly ash, cover and green manure crop).

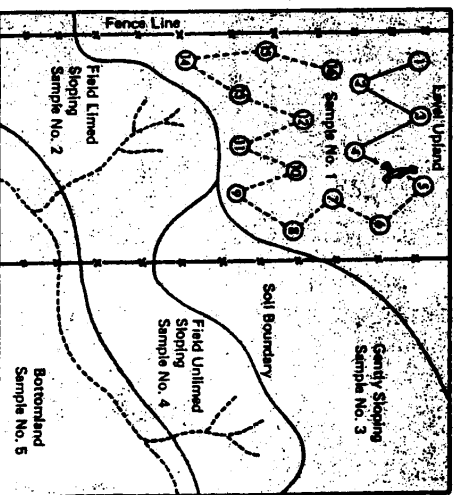
***History of nutrient application for recent crops will be helpful in revealing fields when crops are not responding as expected to applied nutrients.**

Appendix 2

HOW TO TAKE A SOIL SAMPLE

1. Soil testing is indispensable for good farm management. Discuss your farm plan with your Extension Agent or Soil Conservationist.
2. Sample with proper tool at proper time. Use sampling tube or auger. If not available, use garden spade or trowel. Sample in late summer or fall for best results. Re-sample annually or every few years, depending on crop.
3. Don't sample unusual areas because you will get a poor sample. Always avoid dead furrows, back furrows, terrace channels, windbreaks, snow fences, old fence lines, old manure and lime piles, wet spots, areas near lime rock roads, near trees, near the boundary between slopes and bottomland, or fields recently fertilized.
4. Divide fields into areas for sampling so that no sample represents more than 10 acres. Sample separately all areas differing in crop growth, soil color, or past management (liming, manuring, fertilizing or cropping). Stay out of areas too small to be limed and fertilized separately.
5. Take soil from at least 15 spots in each area. Scrape away surface litter. For land in row crops take a small amount of soil to a depth of 6 inches (or plow depth) from at least 15 spots. If already planted, obtain soil between rows and not from rows. For lawns and pastures, sample 2 inches deep; for meadows, sample 4 to 6 inches deep. Follow directions on soil test sheet carefully.
6. When spade is used, save soil from middle of slice. First, dig a V-shaped hole to required depth. Second, cut a ½-inch thick slice of soil from face of hole. Third, trim away soil from both sides of spade so as to leave a 1-inch strip of soil down the middle of the spade. Fourth, place this in a clean pail.

7. Mix all soil taken from each separate area thoroughly in a clean pail. Place ½ to 1 pint of soil in soil test mailing bag and discard remaining soil. If soil is wet, leave it to dry before mailing. Do not heat the soil. Stones and roots must be removed from the sample.
8. Fill out information sheet as accurately as possible. Only when all information is listed can reliable recommendations be made.
9. Number samples—keep your own record. Sketch areas sampled on map. Double check the numbers on the sample bag and the information sheet.



A field may be divided into areas for sampling as shown. Sample 1 might include level upland, samples 2, 3 and 4 might represent sloping areas, and sample 5 a bottomland area. Soil from at least 15 spots in each area is mixed to get each of the 5 samples for sending to the laboratory.

WEST VIRGINIA SOIL TESTING SERVICE

Soil testing is a joint effort of the Cooperative Extension Service and the Agricultural Experiment Station, West Virginia University, and is funded by the West Virginia legislature.

The person wishing to have soil tested will:

- Obtain information sheets and sample bags from his County Extension Agent.
- Take sample according to instructions.
- Fill out information sheet completely.
- Send samples and information sheets to Soil Testing Lab, West Virginia University, Morgantown, 26506. (293-6258)

The WVU Cooperative Extension Service — through its County Extension Agents will:

- Furnish sample bags and information sheets.
- Give advice on taking samples and filling out information sheets.
- Recommend soil treatment on the basis of soil tests, from information you have provided and from their personal knowledge of the area.

The Soil Testing Lab of the College of Agriculture & Forestry will:

- Test the soil sample for pH (acidity), lime requirement, available phosphorus, potassium, calcium and magnesium.
- Report results of tests to your Extension Agent and cooperating agencies in your County.
- Accept requests for repeat tests and for other kinds of analyses made through your County Extension office.

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Programs and activities offered by the West Virginia University Cooperative Extension service are available to all persons without regard to race, color or national origin.

Cooperative Extension Work in Agriculture and Home Economics, West Virginia University and the United States Department of Agriculture. Cooperative. R. L. Stump, Director, Morgantown.

Appendix 3

MANURE SPREADER CALIBRATION (1)

Type of spreader

_____ Converted Box Spreader

_____ Lime Spreader (Pull Behind)

_____ Converted Box Spreader

Manure spreader Capacity

Length avg. _____ A

Width avg. _____ B

Depth avg. _____ C

_____ $A * B * C = D$

Length * Width * Depth = Cubic feet _____ D

Manure/Litter Density

Weight of filled container in pounds _____ E

Cubic feet in Container _____ F

Pounds per cubic foot _____ G

Volume of spreader in tons

$\frac{D * G}{2000}$

$\frac{\text{Cubic feet of spreader} * \text{Pounds per cubic foot}}{2000 \text{ pounds per ton}} \quad H$

Application Area

Length * Width = Square Feet _____ I

Application Rate

Tons/Acre

$\frac{H}{I} \quad \frac{\text{Tons applied} * 43560 \text{ Ft}^2}{\text{Application Area Ft}^2} \quad J$

MANURE SPREADER CALIBRATION (2)

Length * Width = _____ A Square feet in Tarp

Tare Weight of tarp = _____ B

Weight of tarp covered with manure/litter _____ C

Pounds of litter on tarp C-B = _____ D

Pounds of litter per square foot of area = D/A

_____ E

Application Rate

Tons/Acre

E* 43560 ft² in one area = _____ F pounds

F/2000 pounds in one ton = _____ G

Appendix 4

Phosphorus Index for Nutrient Management

Purpose:

The Phosphorus Index (P Index) is a tool that can identify farm fields that are a potential source of phosphorus (P) pollution of surface waters. Using the P Index can help a farmer identify fields and management practices that have the greatest potential to pollute bodies of water with phosphorus. The P index can help land users assess management strategies to minimize P loss from agricultural areas.

Concept:

On agricultural land when annual application of phosphorus exceeds its removal by crops, then phosphorus will accumulate in soils. Phosphorus accumulation in soils leads to high soil test values for phosphorus. A soil testing high for P can be a source of phosphorus pollution. Movement of phosphorus from crop fields into bodies of water may lead to excessive growth of algae (algal bloom). Algal bloom adds easily decomposable organic matter to water. Decomposition of organic materials requires oxygen. Thus, algal bloom caused by phosphorus movement to a body of water leads to reduction of oxygen in water. This lack of oxygen can kill aquatic animals such as fish. However, most P initially added to land through fertilizer or manure reacts with soil components, converting to an insoluble form or attaching to soil particles. Thus, most P loss in agriculture is associated with loss of soil particles.

A large number of factors determine phosphorus loss from a field. These include a soil test value for phosphorus; source, method, rate, and timing of P application; susceptibility of a given soil to erosion; and management practices. The P index quantitatively determines the relative risk of P movement from a given field by considering most of the factors that govern P losses. The P Index for a field can be calculated by using the following worksheet.

Worksheet for Calculating P Index for a Field

P Index rating value from soil test

If soil test value is 0 to 50 lbs P/acre, enter 1 in box A.

If soil test value is 51 to 80 lbs P/acre, enter 2 in box A.

If soil test value is 81 to 200 lbs P/acre, enter 4 in box A

f soil test value is more than 200 lbs P/acre, enter 8 in box A.

Box A _____

P Index rating value from manure application

If applying no manure, enter 0 in box B.

If applying 1 to 30 lbs P₂O₅/acre from manure, enter 1 in box B.

If applying 31 to 60 lbs P₂O₅/acre from manure, enter 2 in box B.

If applying 61 to 90 lbs P₂O₅/acre from manure, enter 4 in box B.

If applying more than 90 lbs P₂O₅/acre from manure, enter 8 in box B.

Box B _____

P Index rating value from fertilizer application

If applying no fertilizer, enter 0 in box C.

If applying 1 to 30 lbs P/acre from fertilizer, enter 1 in box C.

If applying 31 to 90 lbs P/acre from fertilizer, enter 2 in box C.

If applying 91 to 150 lbs P/acre from fertilizer, enter 4 in box C.

If applying more than 150 lbs P/acre from fertilizer, enter 8 in box C.

Box C _____

P Index rating value from manure/fertilizer application method

If applying no manure/fertilizer, enter 0 in box D.

If placing manure/fertilizer deeper than 2 inches, enter 0.5 in box D.

If incorporating manure/fertilizer immediately before crop, enter 1 in box D.

If incorporating manure/fertilizer more than 3 months before crop or are surface applying manure/fertilizer less than 3 months before crop, enter 2 in box D.

If surface applying manure/fertilizer (no incorporation of manure/fertilizer into soil) more than 3 months before crop or are surface applying manure to a pasture land, enter 4 in box D.

Box D _____

P Index rating value from soil erosion

If soil loss from this field is less than 5 tons/acre/year, enter 1.5 in box E.

If soil loss from this field is 5 to 10 tons/acre/year, enter 3 in box E.

If soil loss from this field is 10 to 15 tons/acre/year, enter 6 in box E.

If soil loss from this field is more than 15 tons/acre/year, enter 12 in box E.

Box E _____

P Index rating value from surface runoff

If surface runoff from this field is less than 0.1 cm enter 0 in box F

If surface runoff from this field is 0.1 to 1.0 cm enter 0.5 in box F

If surface runoff from this field is 1.0 to 5.0 cm enter 1.0 in box F

If surface runoff from this field is 5.0 to 10.0 cm enter 2 in box F

If surface runoff from this field is more than 10 cm enter 4 in box F

Box F _____

Total P Index rating value for the site.

Add the P Index value points from boxes A, B, C, D, E and F and enter the total in box G.

The value in box G represents Total P Index value for the site.

Box G _____

Site vulnerability to P-loss as a function of Total P Index rating values

Site vulnerability rating	Total P Index rating value
Low	<8
Medium	8 to 14
High	15 to 32
Very High	>32

Low to medium site vulnerability ratings indicate that current management practices are adequate for protection of surface waters from phosphorus pollution. High and very high site vulnerability ratings indicate a need for improved management practices.

Natural
Resources
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Service

5 High Street
Room 201
Martinsburg, WV
26005
(304) 291-4152

Subject: ECS - Phosphorus Index

Date: February 24, 1997

**To: Moorefield, FO
Franklin, FO
Romney, FO
Petersburg, FO
Keyser, FO**

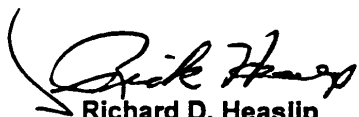
File Code: 190

Based upon our February 13, 1997 in-field investigation of cropland that are potential sources of phosphorus contamination, I am providing the following guidance to minimize phosphorus discharge from a field with high or very high P index rating.

For cropland fields with slopes of 0-3% indirectly discharging water to an adjacent stream, the following practices will be required:

- Nutrient Management
- Proper litter storage
- 15 foot wide grass field border along the outside of the field boundary
or
- Cover crop (planted by October 1)
or
- Crop residue management (minimum 50% residue after harvesting)
- Market surplus litter

This change in the Phosphorus Index Models' conservation practice list for Table B will allow you and the farmer to more effectively address the problem based upon site conditions.



Richard D. Heaslip
State Resource Conservationist

cc: Mike Napoletano
Orland Parks

Table A

Management practices to minimize phosphorus movement from crop land to bodies of water when P index is rated high /Very high. These options are for the fields that are directly discharging water to an adjacent stream.

<u>Slope</u>	<u>Practices</u>
0 - 8% feet	Grass filter strips that are more than 30 wide. NUTRIENT MANAGEMENT <ul style="list-style-type: none">■ Apply manure based on the crop requirements for nitrogen■ Calibrate spreader for manure application■ Apply litter at a distance of more than 50 feet from the water source■ Avoid litter application on snow or frozen soils PROPER LITTER STORAGE <ul style="list-style-type: none">■ Stack litter with cover in field MARKET SURPLUS LITTER COVER CROPS OR RESIDUE MANAGEMENT <ul style="list-style-type: none">■ To prevent movement of sediment-bound phosphorus
8 – 15%	All the practices for 0 – 8% slope and <ul style="list-style-type: none">■ Crop rotations■ No-Till
15 – 25%	All the practices for 8 – 15% slope and <ul style="list-style-type: none">■ Field or Contour Strips

Table B

Management practices to minimize phosphorus movement from crop land to bodies of water when P index is rated high /Very high. These options are for the fields that are indirectly discharging water to an adjacent stream.

Slope

Practices

0 - 8%

Grass waterways

NUTRIENT MANAGEMENT

- Apply manure based on the crop requirements for nitrogen
- Calibrate spreader for manure application
- Apply litter at a distance of more than 50 feet from the water source
- Avoid litter application on snow or frozen soils

PROPER LITTER STORAGE

- Stack litter with cover in field

MARKET SURPLUS LITTER

COVER CROPS OR RESIDUE MANAGEMENT

- To prevent movement of sediment-bound phosphorus

8 – 15%

All the practices for 0 – 8% slope and

- Crop rotations
- No-Till

15 – 25%

All the practices for 8 – 15% slope and

- Field or Contour Strips

Table C

Management practices to minimize phosphorus movement from pasture lands when P index is high /very high.

Slope

0 - 8%

strips

Practices

Treatment of runoff from livestock concentration areas by grassy filter

NUTRIENT MANAGEMENT

- Apply manure based on the crop requirements for nitrogen
- Calibrate spreader for manure application
- Apply litter at a distance of more than 50 feet from the water source
- Avoid litter application on snow or frozen soils

PROPER LITTER STORAGE

- Stack litter with cover in field

MARKET SURPLUS LITTER

More than 8%

All the practices for 0 – 8% slope and

- Maintain a minimum grazing height of 3 inches
- For rotationally grazed pastures use WVU recommendations for grazing heights

Table D

Management practices to minimize phosphorus movement from hay lands when P index is high /very high.

Slope

All Slopes

Practices

NUTRIENT MANAGEMENT

- Apply manure based on the crop requirements for nitrogen
- Calibrate spreader for manure application
- Apply litter at a distance of more than 50 feet from the water source
- Avoid litter application on snow or frozen soils

PROPER LITTER STORAGE

- Stack litter with cover in field

MARKET SURPLUS LITTER

CROP ROTATION

- Incorporate P into plow layer during reseeding or change of crop

Appendix 5

Soil Rating for Nitrate and Soluble Nutrients

Introduction

This section provides a way to determine the degree to which water percolates below the rootzone in certain soils. Percolating water containing dissolved nitrates or other soluble nutrients could be a hazard to ground water. The method is based on a Leaching Index (LI)¹.

For areas with ground water concerns, the LI should be determined to evaluate the potential for contaminating the ground water with soluble nutrients. The LI uses annual precipitation, hydrologic soil group, and rainfall distribution data.

Leaching index

A LI map for each hydrologic soil group was developed for each state and is being provided during the Water Quality workshops. The hydrologic group describes those soils that do not have dual hydrologic ratings because of differences in drainage. Soils with hydrologic rating such as A/D should be evaluated on the basis of the current drainage status. If the soil has a high LI and is over a shallow aquifer, soluble nutrients-- especially nitrates-- may contaminate the water.

The LI does not account for irrigation. If irrigation is applied only to supply plant needs, there will be little additional loss below the rootzone. The additional loss would be relative to the precipitation events after the soil profile is saturated or nearly saturated due to irrigation.

In areas of marginal water quality, the amount of irrigation water applied includes a leaching fraction to insure that salts do not build up in the soil. If a leaching fraction is applied, this amount of water must be added to the LI. For example, if the leaching fraction is 1.2 and irrigation is applied to make up a 4 inch soil-water deficit, a 4.8 inch (1.2×4.0 in) irrigation would be applied. The LI should be increased by 0.8 inches. The same calculation must be made for each irrigation.

Procedure

Follow these steps to determine the leaching index of a certain soil:

1. Find the soil's hydrologic group.
2. Locate the iso-leaching map for that group.
3. From the map, based on the soil location, determine the LI.

¹The method to calculate the Leaching Index was developed by J. R. Williams and D. E. Kissel in "Water Percolation: An Indicator of N Leaching Potential", from *Managing Nitrogen For Groundwater Quality and Farm Profitability*, Edited by R. F. Follet (Unpublished).

Guidelines for recommendations:

1. A LI below 2 inches would probably not contribute to soluble nutrient leaching below the rootzone.
2. A LI between 2 and 10 inches may contribute to soluble nutrient leaching below the rootzone and nutrient management should be considered.
3. A LI larger than 10 inches will contribute to soluble nutrient leaching below the rootzone. Nutrient management practices should be intense or soluble nutrients should not be applied. Also, consider using conservation practices that minimize infiltration, such as strip cropping rather than pipe outlet terraces.

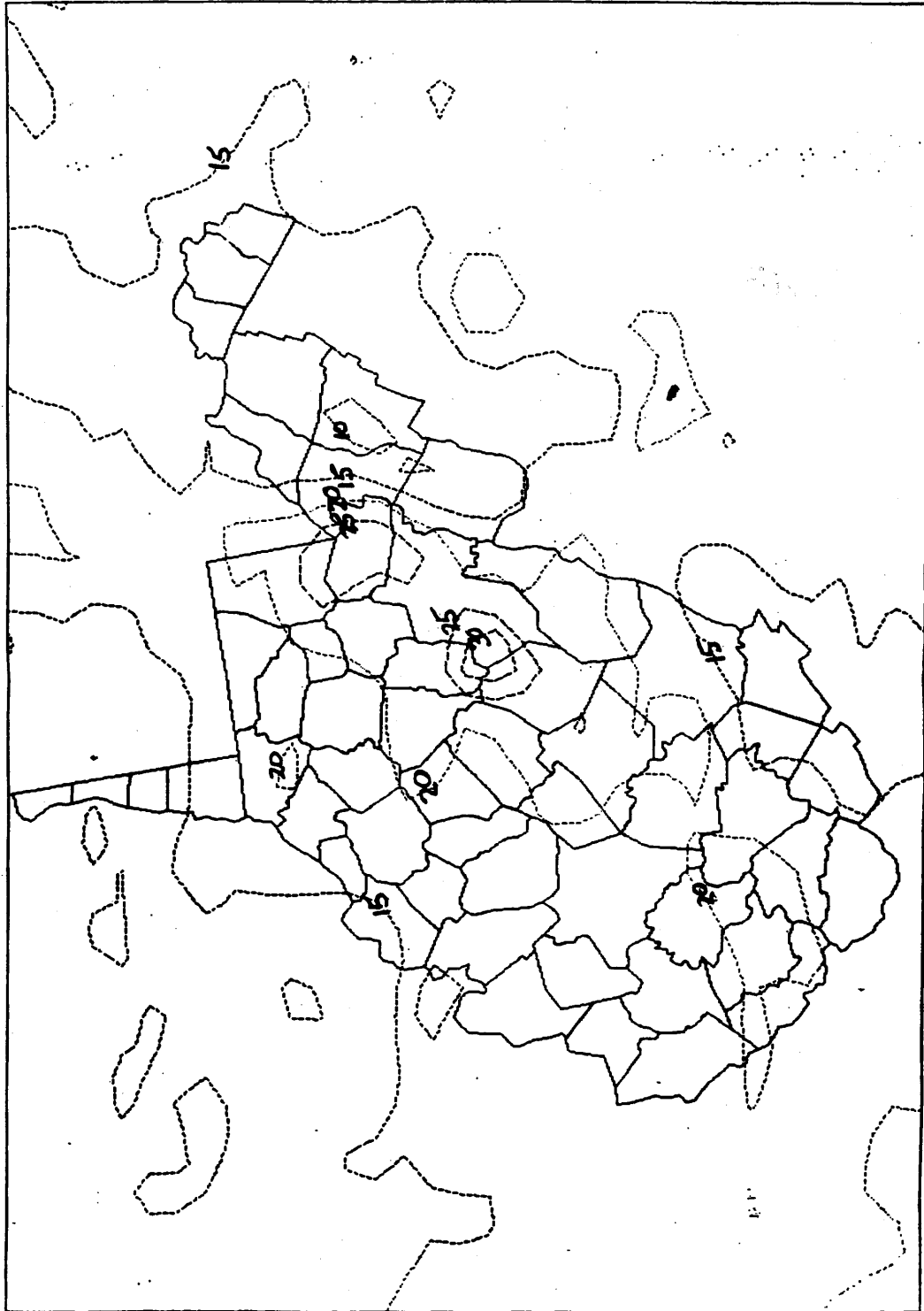
Definitions:

1. Equals SMALL Leaching Index
2. Equals INTERMEDIATE Leaching Index
3. Equals LARGE Leaching Index

west virginia
April 1990

Section II-D

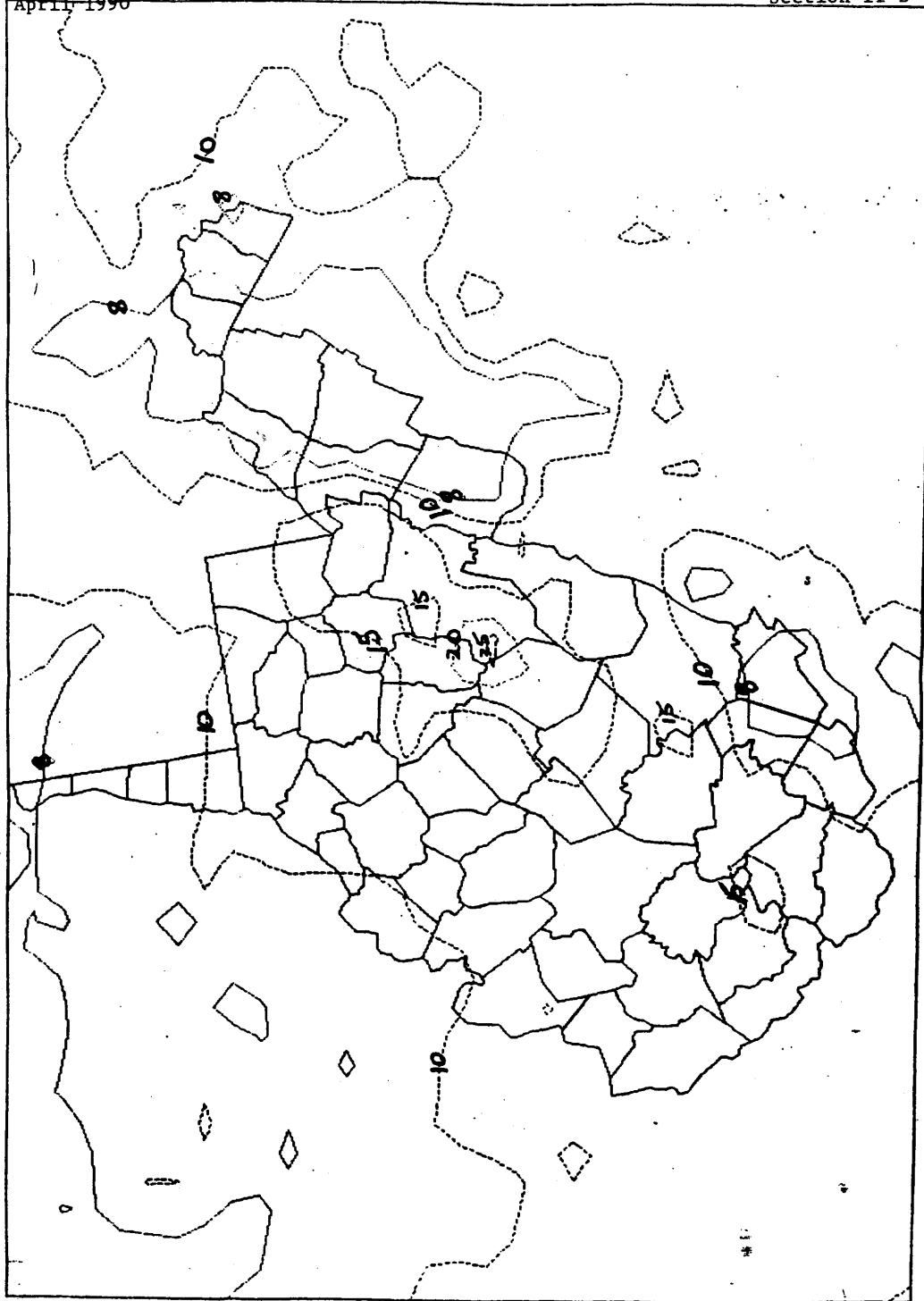
LEACHING INDEX FOR HYDROLOGIC GROUP A
WEST VIRGINIA



West Virginia
April 1990

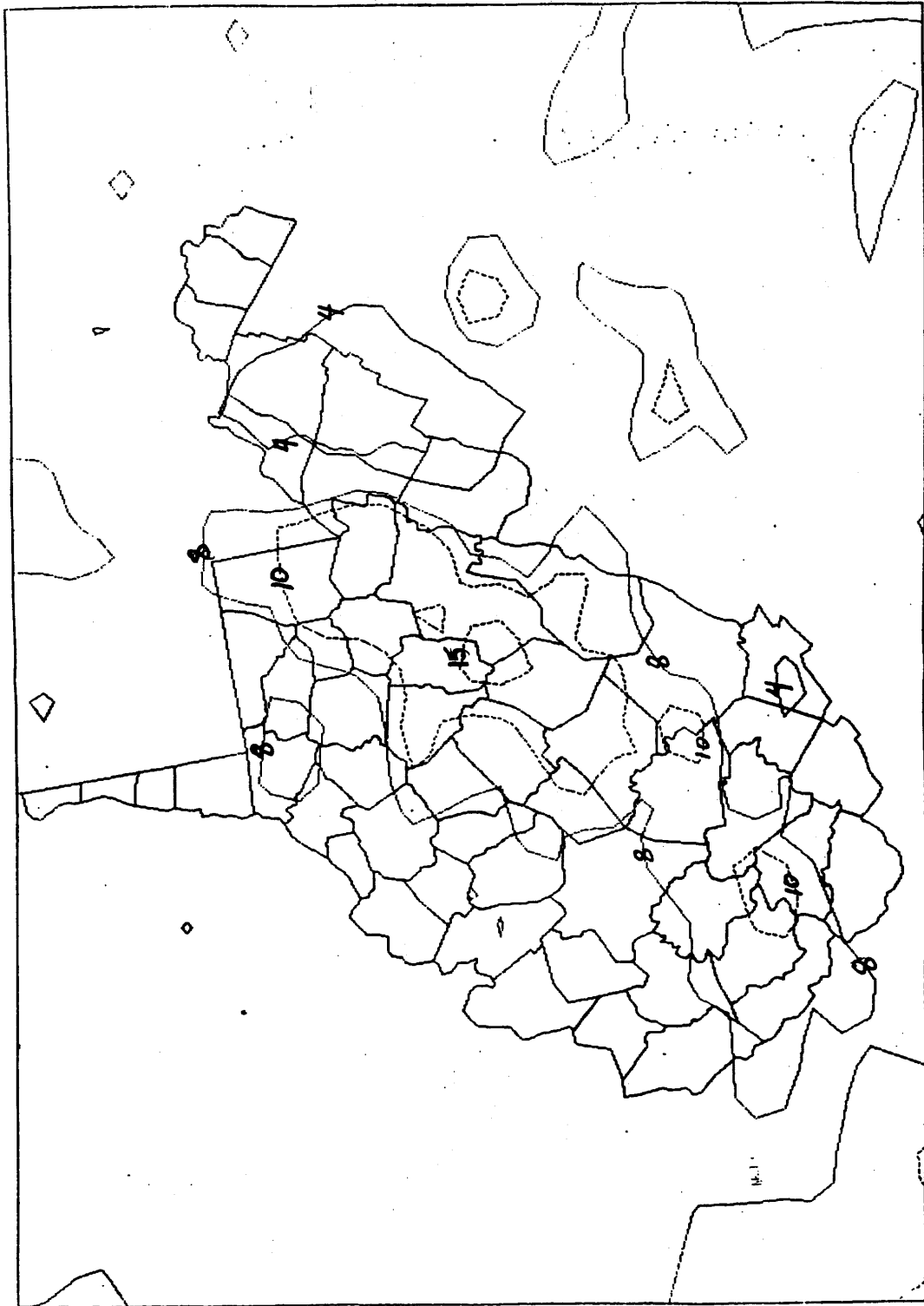
Technical Guide
Section II-D

LEACHING INDEX FOR HYDROLOGIC GROUP B
WEST VIRGINIA



April 1990

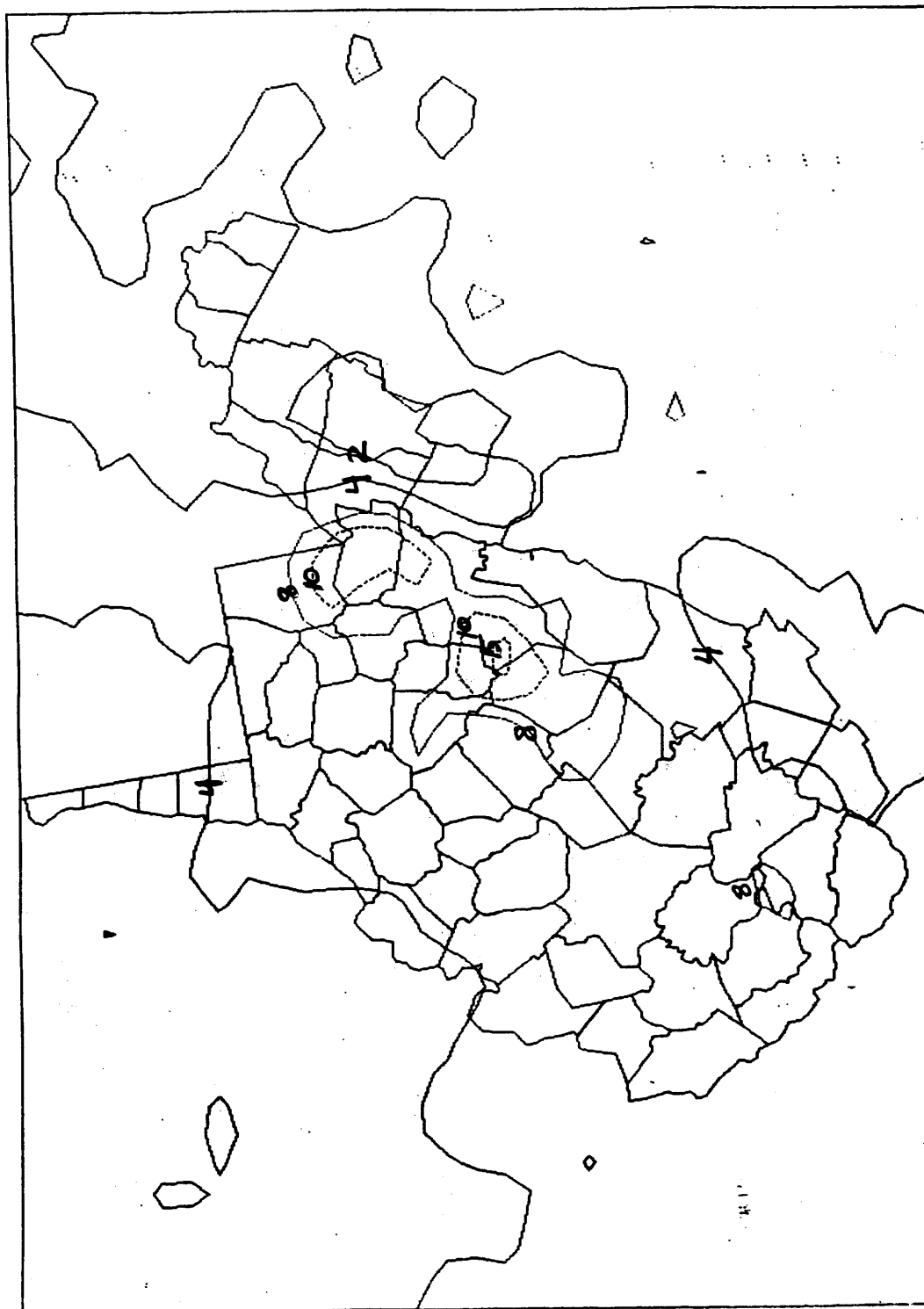
LEACHING INDEX FOR BIOLOGIC GROUP C
WEST VIRGINIA



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Section II-D

LEACHING INDEX FOR HYDROLOGIC GROUP D
WEST VIRGINIA



HYDROLOGY:

Soil Names and Hydrologic Soil Groups

Albrights - C	Cateache - C	Gallia - B
Allegheny - B	Cavode - C	Gauley - C
Allegheny Variant- A	Cedarcreek - C	Gilpin - C
Allen (use Gallia)	Chagrin - B	Ginat - D
Andover - D	Chavies - B	Glenford - C
Ashton - B	Chilhowie - C	Grigsby - B
Atkins - D	Chilo (use Ginat)	Guernsey - C
Barbour - B	Clarksburg - C	Guthrie
Basher - B	Clifton - B	(use Lawrence)
Belmont - B	Clymer - B	Guyan - C
Benevola - C	Cookport - C	Guyandotte - B
Berks - C	Coolville - C	Hackers - B
Bethesda - C	Corydon - D	Hagerstown - C
Blackthorn - B	Cotaco - C	Hartsells
Blago - D	Craigsville - B	(use Cylmer)
Blairton - C	Culleoka - B	Hazleton - B
Bodine (use	*Dekalb - C	Holly - D
Elliber)	Dormont - C	Holston
Braddock - B	Drall - B	(use Allegheny)
Briery - C	Duffield - B	Huntington - B
Brinkerton - D	Duncannon - B	Itmann - C
Brooke - D	Dunmore - B	Janelew - C
Brookside - C	Dunning - D	Jefferson - B
Buchanan - C	Edgemont - B	Kanawha - B
Calvin - C	Edom - C	Kaymine - C
Calvin High Base	Elkins - D	Laidig - C
Substratum	Elliber - A	Lakin - A
(use Cateache)	Ernest - C	Landes - B
Calvin Netural	Fairpoint - C	Latham - D
Substratum	Faywood - C	Lawrence - C
(use Cateache)	Fenwick - C	Leadvale (use
Caneyville - C	Fiveblock - C	Ernest)
Captina - C	Frankstown - B	Leetonia - C
Carbo - C	Frederick - B	

*For Dekalb, use B where bedrock is fractured.

Reference;
Chap. 2, EFM,
Table 2-1
WV County Soil
Reports and
Soil 5's

U.S. DEPARTMENT OF
AGRICULTURE
Soil Conservation Service
West Virginia

Exhibit WV 2-1
Sheet 1 of 2

WV 2-91(3)

(210-V-EFM, Amend-WV40, March 1990)

HYDROLOGY:

Soil Names and Hydrologic Soil Groups

Lehew - C	Otwell - C	Taggart - C
Lickdale - D	Peabody - D	Teas (use Cateache)
Licking - C	Philo - B	Tilsit - C
Lily - B	Pickaway	Tioga - B
Linden - B	(use Lawrence)	Toms - C
Lindside - C	Pineville - B	Trussel - C
Litz - C	Pope - B	Tumbez (use
Lobdell - B	Potomac - A	Opequon)
Mandy - C	Purdy - D	Tygart - D
Markland - C	Ramsey - D	Tyler - D
Massanetta - B	Rayne - B	Upshur - D
McGary - C	Robertsville - D	Vandalia - D
Meckesville - C	Rushtown - A	Vincent - C
Melvin - D	Schaffenaker - A	Waynesboro
Mertz - C	Sciotoville - C	(use Braddock)
Monongahela - C	Sees - C	**Weikert - C/D
Montevallo	Senecaville - B	Wellston -
(use Weikert)	Sensabaugh - B	(use Rayne)
Moshannon - B	Sequatchie	Westmoreland - B
Murrill - B	(use Chavies)	Wharton - C
Muskingum - C	Sewell - C	Wheeling fine
Myra - C	Shelocta - B	sandy loam - B
Nolin - B	Shouns - B	Wheeling gr. sandy
Nolo - D	Simoda - C	loam - A
Opequon - C	Skidmore - B	Woodsfield - C
Orrville - C	Summers - B	Wyatt (use
		Markland)
		Zoar - C

**For Weikert, use C where bedrock is fractured and D where bedrock is solid and impervious.

Reference;
Chap. 2, EFM,
Table 2-1
WV County
Soil Reports

U.S. DEPARTMENT OF
AGRICULTURE
Soil Conservation Service
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Exhibit WV 2-1
Sheet 2 of 2

WV 2-91(4)

(210-V-EFM, Amend-WV40, March 1990)